We know of only three other records at high altitude, all in Ladakh, Jammu and Kashmir (O. Pfister *in litt.* 2001). An individual was recorded on 15 August 1980 at Choglamsar (3,450 m) near Leh by a University of Southampton expedition. Another was recorded by a bird tour group on 10 August 1993 in the Markha valley at c.4,000 m. Finally, one was seen at 4,150 m at Rangdum/Zanskar on 26 June 2000 (O. Pfister *in litt.* 2001).

Like the House Sparrow *Passer domesticus*, the House Crow is a commensal species. Increased tourism and devlopment of permanent army camps in Ladakh seems to have facilitated its spread to higher areas. The species has probably moved up the Leh–Manali road where human settlements have increased recently.

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Harkirat Singh Sangha, B-27, Gautam Marg, Hanuman Nagar, Jaipur 302021, India. Email: sangha@datainfosys.net
Rishad Naoroji, Godrej Bhavan, 4A Home Street, Fort, Mumbai 400001, India

Foraging and nesting behaviour of Asian Paradise-flycatcher *Terpsiphone paradisi* in Mudumalai wildlife sanctuary, Tamil Nadu, India

V. GOKULA and LALITHA VIJAYAN

The Asian Paradise-flycatcher *Terpsiphone paradisi* occurs from Turkestan and Afghanistan, through the Indian subcontinent to China and the western Lesser Sundas (Robson 2000). In the Indian subcontinent it is found in the Himalayan foothills from north Pakistan east to Arunachal Pradesh and north-east India, south through much of the subcontinent apart from north and north-west India. North and central Indian birds winter further south in the peninsula (Grimmett *et al.* 1998). Males occur in two colour morphs (rufous and white), which Mizuta (1998) considered to be subadults and adults respectively. However, Mulder *et al.* (2002) have shown in Madagascar Paradise-flycatcher *T. mutata* that some males retain the rufous plumage as adults. We studied the foraging and breeding behaviour of paradise-flycatchers in Mudumalai wildlife sanctuary, Tamil Nadu, during 1995–1996. Here, both morphs are found, although only the rufous morph was found breeding. It is presumed that residents are supplemented by migrants during December–May, but in the absence of morphometric data, discrimination of race was not possible.

Mudumalai wildlife sanctuary (MWS) is located between 11°30–31′N and 76°27–43′E in the Nilgiri hills, at an average elevation of 1,000 m. Temperatures average 14–17°C during December–January and 29–33°C during March–May. Annual rainfall varies from 600 mm to 2000 mm, and mainly falls during the south-west monsoon (June–August), and less heavily during the north-east monsoon (September–November). The vegetation varies from thorn forest in the east to semi-evergreen forest in the west. This study was carried out in thorn forest, which is dominated by *Acacia chundra*, *A. leucophloea*, *A. ferruginea*, *Anogeissus latifolia*, *Ziziphus* spp., *Sapindus emarginatus*, *Phyllanthus emblica*, *Erythroxylum monogynum*, *Cassia fistula*, and *Capparis* spp. Further details of the study area are given in Desai (1991).

METHODS

Foraging records were collected during the dry season in January to April 1995 and 1996. Observations were made during the four hours after sunrise. The first foraging observation was recorded for any individual encountered, following MacNally (1994). For each observation, the height (to the nearest metre), substrate and method were noted. Substrates were classified as ground, trunk/main branches, twigs, foliage, and air. Foraging method was categorized as glean (food item picked from its substrate by a standing or hopping bird), probe (when the beak penetrated or lifted the substrate to locate concealed food), pounce (when the bird flew from a perch and grabbed the food item as it landed on the substrate), or sally (=flycatching, when a bird caught prey on the wing). Data collected for the entire study period were pooled for analysis (no significant differences in weather were observed between years).

A 10 ha plot was searched intensively for nests. A nest was considered active if adults were seen nest building or renovating, incubating, or feeding young in or adjacent to the nest. Nest height (using a clinometer) and internal and external width were noted. 'Nest visibility' was estimated by viewing the nest at nest-level from a distance of 2, 5, 7 and 10 m in each of four cardinal directions (Martin and Roper 1988) and

calculating the % of positions from which it was viewable. The nest plant species was identified, and its height and girth at breast height (gbh) was recorded. A 0.07 ha circular plot centred at the nest-plant was determined for every nest, in order to study nest-site selection (following Titus and Mosher 1981). Nest-patch variables were measured within the plot to identify the microhabitat required for nesting. These included: % canopy cover (measured using a hand mirror marked with a grid, and by estimating the shaded area, following Martin and Roper 1988); % shrub cover; % ground cover; distance to nearest road (measured in the field or from 1:50,000 maps); and degree of human disturbance (% of nest plant with signs of lopping or cutting). The method for examining nest-site selection followed previous studies (e.g. Bechard *et al.* 1990, Hullsieg and Becker 1990): the 10 ha study plot was divided into forty 50x50 m grids, of which 20 were selected randomly, and the tree or shrub at the centre was determined. All the variables other than nest variables were evaluated for this tree or shrub. To compare real nest sites and randomly selected sites, univariate analysis of variance (ANOVA) was carried out following Sokal and Rohlf (1981) using SPSS software (Noursis 1990).

RESULTS AND DISCUSSION

Foraging

Foraging attempts were largely made between clumps of *Lantana camara* or shrubs, at a height of 1.1–2 m. Most insects were taken in the air; a minority from the ground. Sallying was the main foraging technique (Table 1).

Nesting

A total of 11 nests were found during the study. They were cone-shaped, and built with fine roots, fibre and small leaves, compacted with cobwebs. Nests were built in shady undisturbed sites, away from the road (Table 2). Seven were placed in *Erythroxylum monogynum* shrubs and four were in *Toddalia asiatica*. Nest-site characteristics (Table 2) were similar to those reported by Mizuta (1998). Three nests each took about seven days to be built. Interestingly, only the male was observed nest-building, although both sexes are known to (Ali and Ripley 1987). Females laid 3–4 pinkish white eggs. The mean incubation period was 15 ± 0.8 days (n=3), and the nestling period was 13–14 days (n=2), similar to that reported by Ali and Ripley (1987).

Nests were placed in shrubs in dry streambeds at sites with significantly higher shrub cover and lower tree density than randomly selected sites, and nest shrubs were significantly lower and slimmer than randomly selected shrubs/trees (Table 3). The higher shrub cover is presumably selected to aid concealment, as Murphy (1983) and Martin (1993) have suggested that predation is the key factor influencing nest-site selection. However, in the present study, all nests except four were predated during the nestling period.

Table 1. Foraging height, substrate and method by Asian Paradise-flycatchers.

	Height (m)			Substrate		Method	
Category	0	0.1–1	1.1–2	Air	Ground	Sally	Pounce
% observations (n = 65)	2	11	87	98	2	98	2

Table 2. Asian Paradise-flycatcher nest-site characteristics (n = 11).

Variable	Mean	SD
Nest tree height (m)	3.3	0.4
Nest tree gbh (cm)	25	2.7
Nest height (cm)	185	16
% ground cover	73	18
% shrub cover	69	7.0
% canopy cover	63	8.2
% shade over nest	92	8.4
Nest depth (cm)	4.4	0.1
External nest diameter (cm)	7.0	0.1
Internal nest diameter (cm)	6.4	0.2
Distance to nearest large tree (cm)	67	0.2
Distance to road (m)	189	76
% nest tree cut/lopped	1.0	3.0
% visibility	33	12

Table 3. Comparison of nest-site variables of actual nest-sites and randomly selected sites.

Parameter	Nest site (n=11)	Random site (n=20)	*P*
Tree height (m)	3.3 ± 0.43	7.0 ± 4.8	<0.05
Tree gbh (cm)	25 ± 2.8	51 ± 20	<0.05
Tree density (per 0.07 ha)	1.4 ± 0.5	4.2 ± 2.0	<0.05
Ground cover (%)	73 ± 17.9	84 ± 33	NS
Shrub cover (%)	69 ± 7.0	30 ± 29	<0.05
Canopy cover (%)	63 ± 8.2	79 ± 23	NS
Distance to road (m)	189 ± 76	568 ± 636	NS

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V. Gokula, Salim Ali Centre for Ornithology and Natural History; Correspondence: Dept. Environmental Zoology, National College, Thiruchirapalli 620 001, Tamil Nadu, India. Email: Gokulae@yahoo.com

Lalitha Vijayan, Salim Ali Centre for Ornithology and Natural History, Mongil pallam, Anaikatti P.O., Coimbatore 641 108, India.

Nest sanitation in Sarus Cranes *Grus antigone* in Uttar Pradesh, India

K. S. GOPI SUNDAR and B. C. CHOUDHURY

Nest sanitation, particularly disposal of nestling faecal sacs, is well-studied in altricial bird species (e.g. Morton 1979, McGowan 1995, Dell'omo *et al.* 1998), but there are few descriptions of this behaviour in precocial species (e.g. Littlefield 1978). Nest sanitation reduces the likelihood of infestation by parasites (fly maggots, fleas, ticks and mites) or pathogens (bacteria and fungi) by maintaining dryness in the nest (Welty and Baptista 1988, Ehrlich *et al.* 1994), and reduces the nest's conspicuousness to predators (Weatherhead 1984, Petit *et al.* 1989). After hatching, egg-shells are routinely carried away from the nest in most bird species (Welty and Baptista 1988). Several avian nest predators are known to use conspicuous shells to locate nests (Tinbergen *et al.* 1963). Removal of eggs with broken shells is carried out in most bird species and is thought to result from 'an ancestral, universal and continuing selection pressure' resulting from the threat that broken eggs pose to other eggs in a nest (Kemal and Rothstein 1988, Mallory *et al.* 2000).

Nest sanitation in Sarus Cranes *Grus antigone* has not been described specifically by previous workers on this species, all of whom have studied a population in Keoladeo National Park, Rajasthan (KNP: Ali 1958, Breeden and Breeden 1982, Ramachandran and Vijayan 1994). This species builds large, conspicuous nests in natural wetlands or paddy fields, and lays 1–2 eggs. The incubation period is 31 days (range: 27–35 days in the present study). The precocial chicks leave the nest permanently after two or three days, and never use the nest beyond a week after hatching (K. S. G. Sundar, personal observations). Nest sanitation is therefore only relevant during and immediately after incubation, in particular, immediately after hatching. Close observation of nests in the wild is difficult since most nests are surrounded by vegetation, and adults may abandon nests and eggs if disturbed (Ramachandran and Vijayan 1994; S. Sharma pers. comm. 2000).

Three possible types of material for nest sanitation were identified: (1) faeces of adult birds during and immediately after incubation; (2) egg-shell and other matter after hatching of the chicks, and (3) partially depredated and infertile eggs. Observations on all three are described and discussed in this note.

METHODS

The breeding biology of Sarus Cranes was studied during two breeding seasons in June 2000–July 2002 in Etawah and Mainpuri districts, Uttar Pradesh, in north-central India. A total of 157 nests were observed, of which 145 were visited at least once during incubation or immediately after hatching. Sarus Cranes in the study area live alongside human settlements, and are accustomed to the presence of humans the year round. As a result, visiting nests never caused incubating birds to abandon the eggs. Adult birds were sexed by observation of unison calls, during which the male droops his primaries and touches the secondaries over the back (Archibald and Meine 1996). In addition, females in all pairs were considerably smaller than males, and the sexes could be readily differentiated when the birds were together.

RESULTS

Adult faeces

Each nest was visited 1–5 times during incubation to check for hatching success, and faeces were never found on the nests. Incubating adults were observed on several occasions to walk away from nests to defecate. Adults continued to use the nest after eggs hatched in eight nests, all of which were located in natural wetlands. On two of these nests adult faeces were found immediately after hatching of the second egg. In one, there was little